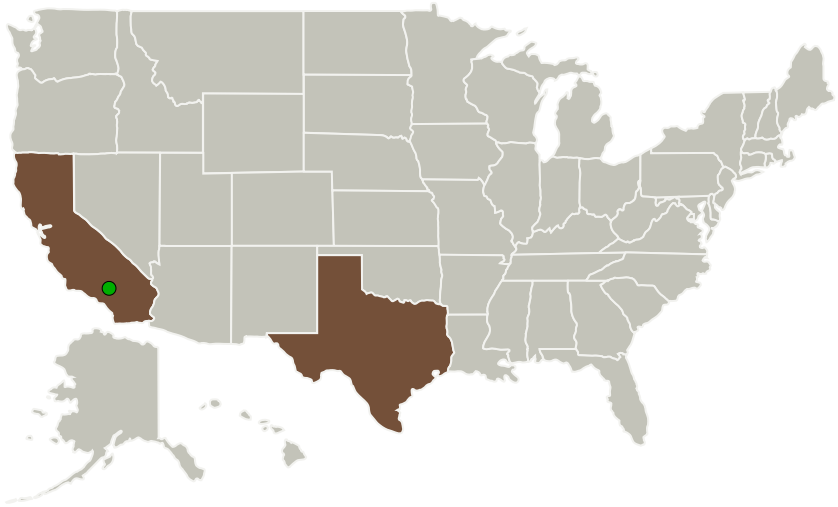
Acoustic Reduction of Flow Separation, Phase I

Completed Technology Project (2010 - 2011)

Project Introduction

Airfoils produce more lift and less drag when the boundary layer is attached to the airfoil. With most aircraft there are combinations of airspeed and angle of attack where the boundary layer at least partially detaches from the airfoil. Reducing boundary layer detachment will increase lift and reduce drag. This will reduce fuel consumption saving money for the operator and improving control for the pilot. Two methods are known to improve boundary layer attachment: heating the air and supplying acoustic pressure at an airspeed and airfoil shape dependent frequency. Carbon nanotubes can be used to produce heating elements as thin as a layer of paint. Because they are thin they can be heated and cooled hundreds of times per second. This combination means that carbon nanotube heating elements can be thermoacoustic speakers to both heat the air stream and generate the appropriate acoustic frequency to maximize boundary zone attachment. All system components have been demonstrated individually achieving TRL 2. Phase I will demonstrate multifrequency sound generation on surfaces in a wind tunnel using nanotube heating elements, and achieving TRL 3. Phase II will include medium seals wind tunnel tests verifying the effects and achieving TRL 5.

Primary U.S. Work Locations and Key Partners



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Organizations Performing Work	Role	Type	Location
Lynntech, Inc.	Lead Organization	Industry	College Station, Texas
Armstrong Flight Research Center(AFRC)	Supporting Organization	NASA Center	Edwards, California
The University of Texas at Dallas	Supporting Organization	Academia	Richardson, Texas

Primary U.S. Work Locations	
California	Texas

Project Transitions

January 2010: Project Start

January 2011: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/140133)*

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Lynntech, Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Principal Investigator:

Alan Cisar

Co-Investigator:

Alan Cisar

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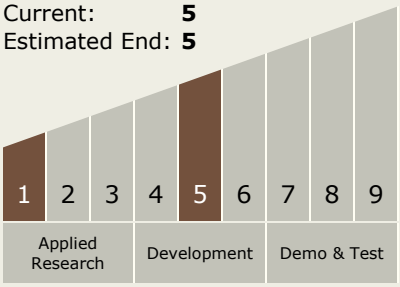
Completed Technology Project (2010 - 2011)

Technology Maturity (TRL)

Start: **1**
Current: **5**
Estimated End: **5**



Technology Areas

Primary:

- TX15 Flight Vehicle Systems
  - TX15.1 Aerosciences
    - TX15.1.8 Ground and Flight Test Technologies

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System